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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In the Matter of )

An Inquiry into the Commission's )  
Policies and Rules regarding AM )  
Radio Service Directional Antenna )  
Performance Verification )

MM Docket No. 93-177  
RM-7594

REPLY COMMENTS OF GREATER MEDIA, INC.

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March 1, 1994

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## TABLE OF CONTENTS

Summary .....	i
I. Background .....	1
II. Field Measurements Are Essential To Maintaining The Integrity Of The AM Band And Affording The Opportunity For Effective Improvements In Certain AM Facilities .....	2
A. Computer Models, Though Useful, Are An Inadequate Substitute For Field Measurements .....	3
B. Field Measurements Are Essential To Facilitate Improvements In AM Service .....	10
III. Some Streamlining Of Current Rules Is Appropriate .....	11
IV. Conclusion .....	13

## **SUMMARY**

Greater Media hereby submits its reply comments in response to the Commission's Notice of Inquiry (MM Docket No. 93-177) to examine rules and policies concerning the performance verification of AM directional antenna systems.

Greater Media generally supports the effort to streamline the body of technical regulations which govern AM broadcasting. Over time many regulations become outdated and in need of revision or elimination. These reply comments canvass various rules which are candidates for revision or elimination.

At the same time, however, Greater Media strenuously opposes possible rules changes which will increase the likelihood of interference within the AM band. In this proceeding, Greater Media is vitally concerned that the Commission not endorse any plan which would wholly substitute reliance upon computer modeling technologies for real world monitoring and measurements of AM systems. All parties would agree that such technologies play a useful role in the design of AM systems. However, as revealed by its own experiences, these technologies are in no way adequate as a complete substitute for actual field measurements. Moreover, elimination of real world monitoring and measurements would foreclose various AM stations from improving their facilities and thereby providing enhanced service to the public.

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Greater Media, Inc. (Greater Media), through its attorneys and pursuant to Sections 1.415 and 1.419 of the rules, hereby submits its reply comments in response to the Notice of Inquiry (Notice) in the above referenced proceeding concerning rules and policies pertaining to the performance verification of AM directional antenna systems. In support thereof, the following is shown:

**I. BACKGROUND**

1. Greater Media through its wholly owned subsidiaries owns and operates seven AM stations, six of which employ directional antennas. Greater Media has been involved in AM broadcasting for more than 25 years and during this time has been an active participant in many of the Commission's proceedings relating to the AM service, particularly those of the past several years which have carefully reviewed and, where appropriate, overhauled and updated the entire body of technical regulations relating to AM broadcasting. Greater Media applauds the Commission's efforts in this ongoing undertaking.

2. In general, Greater Media supports any changes to the Commission's rules which eliminate outdated, redundant or otherwise unnecessary provisions. Greater Media likewise supports provisions in the rules for any new technologies or methodologies which may

contribute positively to the health of the AM service. At the same time, consistent with its positions taken in other proceedings, Greater Media strenuously opposes changes in the rules which may result in increased interference, either through inadequate interference standards or inadequate assurances that a station can readily ascertain the real world performance of its own transmission system or that of a competitor.

3. Greater Media has reviewed the comments of various parties in this proceeding and observes that most commenters generally agree that elimination of outdated or redundant rules is desirable. Later in this filing, Greater Media will address each of the sections of the rules identified in the Commission's Notice as candidates for revision or elimination. However, in Greater Media's view, the key issue in this proceeding concerns the possible use of the various computer modeling technologies as a wholesale substitute for real world monitoring and measurements of AM systems. In particular, Greater Media opposes any plan to extend reliance upon these technologies to the point where the initial adjustment and periodic performance monitoring of a directional antenna system is done solely with the "internal parameters" of the array which are derived purely from computer models.<sup>1</sup>

## **II. FIELD MEASUREMENTS ARE ESSENTIAL TO MAINTAINING THE INTEGRITY OF THE AM BAND AND AFFORDING THE OPPORTUNITY FOR EFFECTIVE IMPROVEMENTS IN CERTAIN AM FACILITIES**

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<sup>1</sup> In this regard, Greater Media observes that there is considerable disagreement on the extent to which reliance upon computer models is appropriate. The original petitioners (du Treil, Lundin and Rackley, Inc.; Hatfield and Dawson Consulting Engineers, Inc.; Moffet, Larson and Johnson, Inc.; Suffa and Cavell, Inc., and Silliman and Silliman) are all relatively united behind the concept of such "internal monitoring" in certain specified types of arrays with well defined antenna sample/monitoring systems. Other commenters, including most notably broadcasters, while generally agreeing that the various computer models are useful and powerful tools for modeling and adjusting directional antenna arrays, were not convinced that conventional "proof of performance" measurements should be wholly and totally eliminated.

**A. Computer Models, Though Useful, Are An Inadequate Substitute for Field Measurements**

4. Greater Media has utilized such computerized models in the initial adjustment and in subsequent modifications and readjustments to a number of its directional antenna systems. In spite of the utility of such tools and their great value in designing and greatly expediting the adjustment of such systems, Greater Media remains absolutely convinced of the value and desirability of retaining actual field measurements of signal strength in any proposed revision of the current rules. While Greater Media agrees that some current measurement procedures can be streamlined<sup>2</sup>, certain measurements must be retained in order to assure the integrity of AM directional arrays and protect facilities from objectionable interference which would not be predicted by computer models.

5. Greater Media has had direct experience with real world cases in point that dramatically illustrate the need for such measurement data. The realities of operating antenna systems virtually assure that such systems will ultimately develop some problems, regardless of the care taken in their construction or maintenance. AM directional arrays commonly consist of numerous large towers arrayed over likewise large amounts of real estate using components (particularly in the antenna monitoring system) that are routinely (particularly in the case of sampling loops, lines, isolation coils and connectors) exposed to all extremes of weather, lightning, direct burial in the ground (usually at depths insufficient to avoid freezing) and other environmental elements. Greater Media routinely builds antenna monitor sampling systems to specifications which equal or exceed any specification suggested by any of the commenters and routinely documents the performance and calibration of such systems. Thus, one might assume that these systems would provide the stability and

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<sup>2</sup>

See in this regard Greater Media's comments at paragraph 27 hereof.

reliability necessary to allow all array monitoring to be done "internally". However, this has not always proven to be the case.

6. At Station WWRC(AM), Greater Media's Washington, D.C. station, a wandering of the phase on one tower was recently discovered. When an anomaly such as this is observed, the first investigative action routinely taken (not only at WWRC but at virtually any competently engineered station) is a check of the monitoring points to see if the antenna array has actually shifted, or if the problem is in the sample system. No simple external check is possible without such monitoring points. Tests with a precision TDR, an impedance bridge (open and short circuit measurements), a hi pot tester and various other test gear revealed no obvious problem with the sample system. A physical examination on two occasions, including the disassembly and resealing of connectors likewise revealed no obvious fault. A close examination of the sample loops, which were brought to the ground, likewise proved inconclusive.

7. The WWRC problem was eventually traced through further extensive examination of the physical plant to a nearly invisible hairline crack in a sample loop insulator which had apparently become internally contaminated and thus conductive and/or reactive. A replacement insulator solved the problem. None of the tests described earlier gave any noticeable indication of this fault.

8. In this case: (1) the tests performed and the test equipment used were considerably beyond those which would be routinely undertaken by most AM stations; (2) the sampling system under examination was built and maintained to specifications equal to or better than those proposed for "internal monitoring"; and (3) the technical personnel involved in the tests were highly qualified and had many years of experience in such work.

9. Clearly, if similar tests had been undertaken on an "internally monitored" system

in the absence of any measured field data or monitoring points, the logical assumption would have been that the actual array parameters had shifted. Relying upon the computer model-based internal system, the array would have been returned "to the numbers" by adjustment of the phases and currents in the antenna elements. In this case, such an adjustment would in fact have resulted in a faulty adjustment of the array with the potential for interference to co- and adjacent channel stations. Such interference would have persisted indefinitely since the licensee would have had absolutely no indication (other than possible, but unlikely, complaints by its spectrum neighbors) that anything was amiss.

10. A similar situation occurred at Greater Media's Station WPEN(AM) in Philadelphia, Pennsylvania. Again, an apparent parameter shift was noted. Similar tests were performed and again revealed no obvious cause. The problem was ultimately traced to a sample line which crossed under a roadway and was partially crushed and cut by a collapsed conduit resulting in contamination of the dielectric. As in the case of WWRC(AM), the monitoring points and a further check of other formally measured proof points, provided positive and immediate verification that the problem was in the sample system.

11. The reality of AM radio in the 1990's is that the average station has limited means and therefore limited access to the best technical resources and equipment. Under these circumstances, it may be reasonably concluded that any similar problem in an internally monitored system with no external measurement data to reference would likely be "fixed" by an improper adjustment of the antenna system. External measurements are not only desirable; they are a necessary and vital to proper maintenance and operation of all directional arrays.



12. Reliance solely upon "internal monitoring" would likewise be in derogation of the legitimate rights and expectations of a station's spectrum neighbors. In the cases described above, one could assume that the station or stations impacted by the increased interference were perceptive enough to notice the problem and determined enough to investigate. In this scenario, what would be the foundation for their suspicions? In the case of a misadjusted "internally monitored" station which operates directionally during all hours, there would not even be an opportunity to collect nondirectional measurement information. Thus the ability to "prove" that the directional array adjustment was faulty via the rationing of DA/non DA data, would be very difficult if not impossible. Compare this scenario to the current situation where a formal proof is on file at the Commission and the data therefrom can be readily accessed and compared to contemporary measurements. More fundamentally (and probably more typically), a check of the offending station's monitor points would probably provide a solid first clue that something was amiss inasmuch as such points have defined maximums. But, of course, without any measurement data available, there would be no such reference.

13. There is clearly great value in such measured data. Conversely, there is great opportunity for increased interference in the absence of such data.

14. Another contention advanced by some of the proponents of reliance on "internal monitoring" is that the currently available modeling techniques are uniformly adequate to permit the final adjustment of directional antenna patterns strictly by observation of a carefully constructed and calibrated antenna monitoring system. One merely adjusts the system to the "numbers" from the modeling program. The pattern is at all times assumed to be correct.

15. To be sure, in the case of relatively simple, loose directional antennas, Greater

Media's own experience is that one may achieve close to the proper adjustment when relying upon such techniques. However, in the case of tighter arrays with deep minima, wide minima or minima far off the tower line, it has been the company's experience that one is generally not able to assure proper adjustment without a certain amount of field measurement work.

16. In the latter regard, a case in point is Station KRLA(AM), Pasadena, California, licensed to a Greater Media subsidiary. Shortly after its acquisition by the company, a wholly new transmitter site for KRLA was constructed. All parts of the system (including the sampling system) were constructed with the best available materials and technology; enormous sums were expended on the project. The KRLA nighttime array consists of four uniform cross sections, Phillystrand guyed, 132 degree towers, arranged in a classic four tower in line configuration. The sampling system was carefully constructed and calibrated to within better than .2 degree accuracy. The array was modeled using the best available method of moments program and the resulting parameters were "dialed in". The resulting adjustment was well within the ball park. But it wasn't "in". The following is a comparison of the predicted parameters and the final "as adjusted" parameters:

<u>Tower</u>	<u>Theo. Monitor</u>	<u>Theo. Phase</u>	<u>Act. Monitor</u>	<u>Act. Phase</u>
	<u>Ratio</u>	<u>Degrees</u>	<u>Ratio</u>	<u>Degrees</u>
1	.328	189.4	.351	184.2
2	.980	94.5	1.045	93.4
3	1.000	0	1.000	0
4	.298	-94.6	.326	-95.5

17. Actual measurements, taken with the array adjusted to the theoretical parameters, clearly showed excessive radiation on several of the critical construction permit azimuths.

Again, the sample system was constructed to standards equal to or in excess of those proposed for "internally monitored" systems. Subsequent adjustments using field measurements were required to bring the array within licensed parameters.

18. In Greater Media's opinion, while the various modeling programs are excellent design and initial adjustment tools, in many cases, particularly those involving "tight" arrays, the model simply is unable to take into account a number of minor, real world variables (some of which may not even be obvious to the engineer) that can significantly impact the final adjustment. There is no end to the environmental factors that can affect an operating AM system; everything from ground vegetation to the effectiveness of the detuning scheme used for unused towers can impact the radiation pattern.

19. A number of commenters who support sole reliance on "internal monitoring" suggest that, in most cases, the physical environment in the vicinity of directional AM stations is so electrically compromised and replete with multiple reradiators, lack of suitable measurement point locations, and various other anomalies that the actual taking of field strength measurements is rendered virtually impossible. In the past several years, Greater Media has had thousands of hours of experience in the taking of such measurements, chiefly in five of the ten largest radio markets in the country. Most AM sites are simply not so encumbered by a predominance of extraneous environmental elements which fatally undermine the accuracy of field measurements. Indeed, in Greater Media's experience, most field measurements are not only very possible to take but are generally very representative of actual radiation on a particular azimuth. Even in the null areas of directional antenna systems, which are notorious for producing 'scattered' data, measurement of an appropriate number of points over a sufficient distance generally produces good data. The point is that those sites having major electrical/electronic environmental challenges are in a distinct

minority. In the case of such sites, the modeling techniques available could be used as a convincing alternative and could be accepted by the Commission on a case by case basis. Greater Media does not believe, however, that it is in the best interests of the industry, specifically in regard to the control of interference, to throw the baby out with the bath water and rely upon the exceptional circumstance as the basis for a rule. Ultimately, it must be stressed that in most cases actual measurements work just fine and are the most reliable indicator that an array is operating properly.

20. Another theory advanced by some of the commenters is that, in some cases due to external influences such as reradiators, where one attempts to adjust a directional array by conventional field measurement techniques, the parameters required to produce proper radiation in the horizontal plane could produce a pattern other than the theoretical pattern at higher vertical angles and thus potentially produce higher-than-predicted skywave radiation. The proposed solution again is to internally monitor the array and not be troubled by what a field meter might see on the ground.

21. Greater Media submits that true, excessive, ground wave radiation, extant over the entire measured radial (as opposed to, for instance, localized reradiation), constitutes nothing less than potentially significant interference to another station or stations which will persist for 100% of the time at a relatively consistent level. This is interference of the most damaging kind.

22. Skywave interference, by contrast, is predicted on a statistical basis and varies widely from moment to moment. Most skywave protection is calculated on the basis of the interfering signal not exceeding a particular value for 10% or more of the time and is further predicated on all such interfering signals arriving simultaneously at maximum intensity. This is clearly not the reality of skywave propagation. Signals routinely fade with

the reality of minute to minute variations in ionospheric propagation and the likelihood of all pertinent interferers arriving at maximum intensity simultaneously at a particular site is not statistically significant.

23. Clearly, if there is a choice to be made, (that is, correct groundwave radiation pattern versus the correct pattern at the higher vertical angles) avoiding groundwave interference is distinctly preferable to avoiding skywave interference because groundwave interference is interference on virtually a 100%-of-the-time basis. Further, field measurement is the clearly the preferable tool for such determinations. In short, at a vast majority of measuring locations, what is read on the meter is the most reasonable indicator of the actual radiation at that point.

24. Ultimately, reliance on computer modeling as the exclusive tool for directional array adjustment is misplaced to the extent that the "right" (antenna monitor) numbers can always be achieved through adjustment of the array. However, without the benefits of field measurements, there can be no guarantee that the "right" numbers have produced the proper pattern.

#### **B. Field Measurements Are Essential to Facilitate Improvements in AM Service**

25. Greater Media also opposes the proposal advanced by some commenters that all allocation work, particularly as it relates to facility improvement, be based strictly on M-3 ground conductivities and that actual measurements, which are currently permitted under the rules, not be allowed. Over the past several years, Greater Media has spent tens of thousands of dollars and hundreds of hours investigating possible upgrades to its various AM stations. Notably, the use of measured conductivities has resulted in the issuance of a construction permit to improve the facilities of Station WWRC(AM) in Washington; the station is currently authorized to increase its daytime power from 5 to 50 kW.

26. Improvements such as this are vital to the survival of the AM service as a viable broadcast medium; in Greater Media's view, the future clearly belongs to those stations which either have or can upgrade to full market signals. The determination of actual conductivities on any pertinent azimuths is the primary tool thorough which such upgrades may be achieved. If the conductivities are clearly shown to be less than M-3, and a facility improvement can be undertaken as a result (an improvement which nonetheless must comply with all pertinent regulations relating to contour overlap and interference), then a station should have the ability to propose such an improvement. The very fact that the Commission has removed the power caps on the formerly class III channels is indicative of the Commission's intent to permit such upgrades when technically possible. To foreclose such opportunities would contribute significantly to the declining health of the AM service and would not serve the public interest in enhanced AM service.

### **III. SOME STREAMLINING OF CURRENT RULES IS APPROPRIATE**

27. Although Greater Media is a strong proponent of retaining field measurements as the primary means for determining proper adjustment of AM directional arrays, it nonetheless believes that the current requirements may be somewhat burdensome in terms of the quantity of data required. In addition, numerous other aspects of the existing rules can be streamlined to eliminate nonessential data and operating requirements. In that light, Greater Media offers the following comments on the sections of Part 73 noted:

- 73.14        The reference to critical directional antennas should be eliminated. This provision of the rules has been unevenly applied in the past and is no longer pertinent.
- 73.33        This section appears to be redundant with section 73.45 and can be eliminated.
- 73.45        Eliminate the references to minimum efficiency. The use of low efficiency radiators should be permitted in appropriate situations. This will offer

stations more flexibility in the siting and design of antenna systems.

- 73.51 Greater Media supports the proposal advanced by several of the petitioners that would allow so called "negative" towers in directional systems to be optionally terminated in a resistive, dissipative network, rather than "returned" to the power divider. In many cases this will result in a much improved bandwidth and better quality audio. Any efficiency loss can and should be made up through an increased power input to the antenna system.
- 73.53 Subparagraph (c), relating to critical antenna systems, should be eliminated (see 73.14 above).
- 73.54 Greater Media supports the elimination of the requirement to determine antenna resistance over a 50 kHz band of frequencies. A single measurement at the carrier frequency will suffice. Further, the requirement to set the common point reactance to zero should be eliminated. In some cases this requirement is actually counterproductive to the optimum performance of newer generation AM transmitters.
- 73.58 This section should be completely revised to eliminate the requirements relating to base current meters. Such metering serves little or no purpose in a modern antenna system utilizing an "approved" antenna monitor and sampling system. The information provided by such metering is at best redundant and at the worst confusing and potentially restrictive in the ongoing maintenance and proper adjustment of the array.
- 73.61 As detailed above, Greater Media strongly supports the retention of field measurements as the primary indicator of proper array adjustment both at the time of commissioning and on an ongoing basis. Some reduction of the total number of measurements required on each radial and the ultimate distance to which such measurements should be taken (see 73.151 below) would be appropriate. Ten to 15 points per radial out to a maximum distance of 16 km would seem a reasonable approach.
- 73.62 This section should be revised to eliminate any reference to base current metering (see 73.58 above) and to critical antenna systems.
- 73.68 Eliminate all references to critical directional antennas. Permit the use of voltage sampling at the tower base for towers up to and including 180 degrees in height. Language should be added to better define the type(s) and mounting location(s) for current sampling loops, torroidal current transformers and the proposed voltage sampling devices. Sampling lines should be required to employ a continuous metallic outer conductor; braided shield cables should not be permitted. Sampling lines attached to towers for significant distances (that is, those associated with sample loops on towers taller than 90 degrees) should be maintained at tower potential with frequent bonding (50' intervals) of the outer conductor to the tower steel.

- 73.69 References to base currents and base current ratios should be eliminated.
- 73.151 Any references to base current meters and ratios should be eliminated. As noted previously, Greater Media supports the retention of field measurements as the primary means of determining initial array adjustment and continuing performance within the limits of the standard pattern. At the same time, changes to Section 73.186 which would eliminate the requirement for measurements beyond 16 km from the site would be appropriate.
- 73.152 No changes.
- 73.153 No changes.
- 73.154 No changes.
- 73.158 No changes.
- 73.186 See 73.151 above.
- 73.189 References to minimum antenna heights (except for Class A stations) and minimum acceptable efficiencies should be eliminated.

#### IV. CONCLUSION

28. The Commission is to be applauded for effecting changes to the AM rules which help broadcasters operate more efficiently. Such changes include the elimination of outdated or redundant rules and the recognition of new techniques and technologies which offer real benefits to the broadcaster and contribute to the health of the AM service. Greater Media can not, however, support changes to the rules which could result in increased interference or the inability of licensees to accurately monitor their own and their competitors' operation in a real world environment. This is particularly important given the badly deteriorated state of many AM facilities and the increasing likelihood that such facilities may decay further to the point that they are far out of adjustment. Likewise, Greater Media is strongly opposed to any restrictions on the ability of existing AM licensees to use any and every legitimate available tool to make what ever improvements may be possible to their existing facilities. In many cases, for licensees which actually operate stations and have to live with



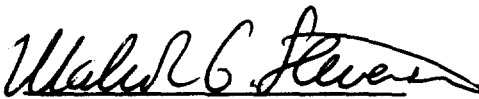
the operational and fiscal realities of AM radio that, only the strong will survive.

29. Greater Media urges the Commission to give very serious consideration to these comments and to other comments filed by broadcasters. It is broadcasters, after all, that will be directly and most significantly impacted by any changes in the rules and likewise by any further deterioration in the interference environment. Any AM broadcaster today, including Greater Media, would jump at the opportunity to reduce operating costs or the costs involved in the construction, renovation or adjustment of its facilities. Nonetheless, cost savings alone can not justify changes to the rules which will likely have an adverse effect upon the service. The Commission should proceed cautiously and carefully when considering the adoption of any changes in the rules which could potentially have such an effect.

WHEREFORE, for the foregoing reasons, Greater Media respectfully urges the Commission to consider rules changes consistent with the above Reply Comments.

Respectfully submitted,

GREATER MEDIA, INC.

By:   
Malcolm G. Stevenson

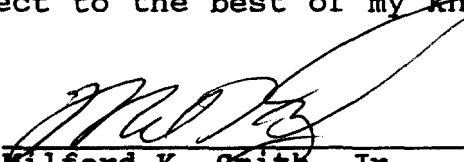
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Its Attorneys

March 1, 1994

Declaration

I declare under penalty of perjury that, except for the facts of which the Federal Communications Commission may take official notice, all of the facts of the foregoing reply comments of Greater Media, Inc. are true and correct to the best of my knowledge and belief.

  
\_\_\_\_\_  
Milford K. Smith, Jr.  
Vice President/Radio Engineering  
Greater Media, Inc.

2-28-94  
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Date